Attorney Docket No. 5656.33

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Ideker
Application No.: 10/648,162
Filed: August 26, 2003
Confirmation No.: 3541
Group Art Unit: 3766
Examiner: Eric D. Bertram
For: Methods, Systems and Computer Program Products for Selectively Initiating Interventional Therapy to Reduce the Risk of Arrhythmia

January 18, 2007

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Commissioner for Patents
P.O. Box 1450
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APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 41.67

Sir:

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed November 20, 2007.

Real Party In Interest

The real party in interest is assignee University of Alabama Research Foundation.

Related Appeals and Interferences

Appellants are aware of no appeals or interferences that would be affected by the present appeal.

Status of Claims

Claims 1-12, 15-18, 21-49 and 52-57 are pending and stand rejected. Appellants appeal the final rejection of Claims 1-12, 15-18, 21-49 and 52-57 by the Final Office Action dated August 23, 2007 (the Action). Claims 1-3, 5-12, 15-18, 21-26, 28-40, 42-49 stand rejected in the Action under 35 U.S.C. §103(a) as being unpatentable over "Significance of Discordant ST Alternans in Ventricular Fibrilation" by Konta ("Konta"), in view of U.S. Patent No. 6,915,156 to Christini ("Christini"). Claims 4, 27 and 41 stand rejected under 35

U.S.C. 103(a) as being unpatentable over Konta and Christini in further view of U.S. Patent No. 6,965,797 to Pastore ("Pastore").

Status of Amendments

The Appendix of Claims submitted herewith reflects the state of the claims of record. No amendments have been filed subsequent to the Final Action.

Summary of Claimed Subject Matter

Independent Claim 1 recites a method for selectively initiating interventional therapy in a subject. Electrical activity is chronically detected in first and second cardiac regions in the subject. *See, e.g.*, page 4, lines 4-5; page 15, lines 16-17, Figure 5, Block 500. Discordant alternans in at least one component of the detected electrical activity are identified based on a comparison of the electrical activity in the first and second cardiac regions. *See, e.g.*, page 4, lines 5-8; Figure 1, signal analyzer 18. Interventional therapy is initiated in the subject responsive to the identification of discordant alternans. *See, e.g.*, page 4, lines 16-18; Figure 1, therapy module 16. The electrical activity comprises an electrogram from internally implanted electrodes positioned in an internal chamber and/or vessel of the heart of the subject. *See, e.g.*, page 13, line 17 - page 14, line 16; Figure 4, electrodes A50, B51, C52, D53, E54, F55, and G56.

Claim 4 depends from Claim 1 and further recites that the component comprises a duration, shape and/or amplitude of an activation recovery interval (ARI). *See, e.g.*, page 5, line 27 – page 6, line 2.

Independent Claim 18 recites a system for selectively initiating interventional therapy in a subject. A plurality of electrodes are configured and sized to chronically detect electrical activity in first and second cardiac regions. *See, e.g.*, page 4, lines 4-5; page 15, lines 16-17, Figure 5, Block 500; page 13, line 17 - page 14, line 16; Figure 4, electrodes A50, B51, C52, D53, E54, F55, and G56. A discordant alternans monitor is operably associated with the electrodes. *See, e.g.*, page 8, lines 24-25; Figure 2, discordant alternans monitor 100. The discordant alternans monitor is configured to identify discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions. *See, e.g.*, page 8, lines 32-33. The discordant alternans monitor is configured to initiate interventional therapy in the subject responsive to

the identification of discordant alternans. *See*, *e.g.*, page 8, line 33 - page 9, line 9. The electrodes are configured to be internally-implantable and positioned in an internal chamber and/or vessel of the heart of the subject. *See*, *e.g.*, page 13, line 17 - page 14, line 16; Figure 4, electrodes A50, B51, C52, D53, E54, F55, and G56.

Claim 27 depends from Claim 18 and further recites that the component comprises a duration, shape and/or amplitude of an activation recovery interval (ARI). *See*, *e.g.*, page 5, line 27 – page 6, line 2.

Independent Claim 38 recites a computer program product for selectively initiating interventional therapy in a subject. *See*, *e.g.*, page 11, line 8 - page 13, line 6. A computer readable storage medium has computer readable program code embodied in the medium, and the computer-readable program code includes computer readable program code configured to chronically detect electrical activity in first and second cardiac regions in the subject (*see*, *e.g.*, page 4, lines 4-5; page 15, lines 16-17, Figure 5, Block 500); computer readable program code configured to identify discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions (*see*, *e.g.*, page 4, lines 5-8; Figure 1, signal analyzer 18); and computer readable program code configured to initiate interventional therapy in the subject responsive to the identification of discordant alternans (*see*, *e.g.*, page 4, lines 16-18; Figure 1, therapy module 16). The electrical activity includes an electrogram from internally implanted electrodes positioned in an internal chamber and/or vessel of the heart of the subject. *See*, *e.g.*, page 13, line 17 - page 14, line 16; Figure 4, electrodes A50, B51, C52, D53, E54, F55, and G56.

Claim 41 depends from Claim 38 and further recites that the component comprises a duration, shape and/or amplitude of an activation recovery interval (ARI). *See*, *e.g.*, page 5, line 27 – page 6, line 2.

Grounds of Rejection to be Reviewed on Appeal

1. Whether Claims 1-3, 5-12, 15-18, 21-26, 28-40, 42-49 are properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Konta and Christini.

2. Whether Claims 4, 27 and 41 are properly rejected under 35 U.S.C. 103(a) as being unpatentable over Konta and Christini in further view of Pastore.

Argument

I. Introduction

As stated in the Examination Guidelines for Determining Obviousness Under 35 U.S.C. §103 in view of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.* (M.P.E.P. §2141), a question regarding whether a claimed invention is obvious under 35 U.S.C. § 103 must include an analysis of the factors set forth in *Graham v. John Deere Co.* (383 U.S. 1, 148 USPQ 459 (1966)), which are described by the Supreme Court in the *KSR* decision to be 1) determining the scope and content of the prior art; 2) ascertaining the differences between the claimed invention and the prior art; and 3) resolving the level of ordinary skill in the pertinent art (hereinafter, the "*John Deere* factors"). The key to supporting any rejection under 35 U.S.C. 103 is the **clear articulation of the reason(s)** why the claimed invention would have been obvious. M.P.E.P. § 2143. A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR Int'l Co. v. Teleflex Inc.*, 550 U. S. 1, 15 (2007). A Court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 13. When it is necessary for a Court to look at interrelated teachings of multiple patents, the Court must determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. *Id.* at 14.

As stated in the M.P.E.P. § 2143.02:

> **Reasonable Expectation of Success Is Required**
> A rational to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art. (emphasis added)(citing *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1395 (2007); *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 62-63, 163 USPQ 673, 675 (1969); *Great Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152, 87 USPQ 303, 306 (1950))

Appellants submit that the present rejections should be reversed because the cited art does not disclose all of the elements recited in the claims, and there are no reasons or reasonable expectation of success to modify the references as proposed by the Examiner.

II. Claims 1-3, 5-12, 15-18, 21-26, 28-40, 42-49 are Patentable under 35 U.S.C. 103(a) in view of Konta and Christini

Independent Claims 1, 18 and 38

Claim 1 recites a method for selectively initiating interventional therapy in a subject, including:

> chronically detecting electrical activity in first and second cardiac regions in the subject;
> identifying discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions; and
> initiating interventional therapy in the subject responsive to the identification of discordant alternans, wherein the electrical activity comprises an electrogram from internally implanted electrodes positioned in an internal chamber and/or vessel of the heart of the subject.

Claim 38 recites a computer program product corresponding generally to Claim 1. Claim 18 recites a system for selectively initiating interventional therapy in a subject including:

> a plurality of electrodes configured and sized to chronically detect electrical activity in first and second cardiac regions; and
> a discordant alternans monitor operably associated with the electrodes, the discordant alternans monitor configured to identify discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions; and to initiate interventional therapy in the subject responsive to the identification of discordant alternans, wherein the electrodes are configured to be internally implantable and positioned in an internal chamber and/or vessel of the heart of the subject.

The Action concedes that Konta does not disclose using electrodes that are positioned in an internal chamber and/or vessel of the heart of the subject. Konta discusses an experiment performed on dogs in which 60 electrodes are attached on the exposed pericardium of the dog. *See* Konta, page 2185, col. 2. The 60 electrodes of Konta are attached through a sock to the epicardium and to the area covering the region of the entire left and right ventricles when the pericardium of the dog is exposed. *Id.*

Christini proposes the analysis of beat-pair to beat-pair differences at a single location, i.e., concordant alternans. Concordant alternans are present when different portions

of the myocardial region are in phase with one another. In contrast, discordant alternans are present when different portions of the myocardial region are out of phase with one another. *See* Appellants' Specification, page 6, line 6-24 and Figure 6. Christini repeatedly emphasizes that "repolarization alternans can be detected from a single spatially-localized endocardial lead." *See* Christini, col. 6, lines 6-8; col. 6, lines 21-25 (cited on page 3 of the Action); and col. 10, lines 63-65. Christini proposes multi-electrode configurations; however, Appellants submit that these configurations would include a relatively small number of electrodes, such as can be connected to a pacemaker or implantable cardiac defibrillator. *See* Christini, col. 5, lines 60-62. Christini states that its proposed method detects repolarization alternans "at the location of one of the electrodes." *See*, e.g., col. 4, lines 4-20 and col. 13, lines 59-65 (Claim 6). Christini discusses that odd numbered beats in each beat pair are subtracted from even numbered beats in the beat pair, and the sign of the difference is determined. Christini states that if this sign is consistent from one beat pair to an adjacent beat pair, then it is an indicator that there is a repeated repolarization alternation. *See* col. 6, lines 5-13. Christini only delivers an electrical stimulus if the sign of the difference in beat-pair to beat-pair magnitude is consistent. *See* col. 6, line 58-60.

The scope and content of the prior art and the differences between the claimed invention and the prior art (*i.e.*, the first and second *John Deere* factors) can, therefore, be summarized as follows: Christini proposes that a single electrode can be used to detect concordant alternans. Christini uses a relatively small number of electrodes, such as can be connected to a pacemaker or implantable cardiac defibrillator. *See* Christini, col. 5, lines 60-62. Christini does not teach the analysis of discordant alternans or that alternans are identified "based on a comparison of the electrical activity in the first and second cardiac regions" as recited in independent Claims 1, 18 and 38. Although the Action takes the position that Konta discloses these features, Konta requires 60 electrodes that are attached to the exposed pericardium of a dog. *See* Konta, page 2185, col. 2. Thus, neither reference discloses or renders obvious identifying discordant alternans based on a comparison of the electrical activity in the first and second cardiac regions using electrodes that are internally implantable and positioned in an internal chamber and/or vessel of the heart of the subject.

As noted above, a finding of obviousness requires that there by no change in the respective functions of the elements of the prior art and that the combination must yield nothing more than predictable results. A reasonable expectation of success is also required.

See M.P.E.P. § 2142.02. Even if the level of skill in the art (*i.e.*, the third *John Deere* factor) is considered to be high, Appellants submit that using the relatively small number of implanted electrodes used to detect concordant alternans in Christini to identify discordant alternans based on the techniques proposed by the 60 electrode configuration on the exposed pericardium of a dog in Konta represents a significant change in the respective functions of the elements of Konta and Christini. Appellants submit that there is no reasonable expectation of success that the methods of Konta, which require 60 electrodes attached to the exposed pericardium of a dog, would be successful when applied to the relatively small number of electrodes under the spatial constraints of internally implanted electrodes used in the pacemaker or implantable cardiac defibrillators of Christini, which detects concordant alternans "at the location of one of the electrodes" (Christini, col. 4, lines 4-20 and col. 13, lines 59-65 (Claim 6)).

Appellants submit that independent Claims 1, 18 and 38 are patentable at least for the reasons discussed above. Claims 2-3, 5-12, 15-17, 21-26, 28-37, 39-40, 42-49 are patentable at least per the patentability of the claims from which they depend. Accordingly, Appellants request that the rejections of Claims 1-3, 5-12, 15-18, 21-26, 28-40, 42-49 under § 103 be reversed.

III. Claims 4, 27 and 41 are Patentable under 35 U.S.C. 103(a) in view of Konta, Christini and Pastore

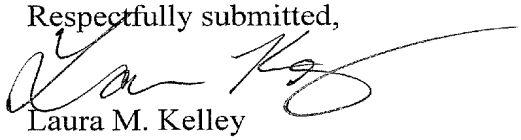
Claims 4, 27 and 41 depend from Claims 1, 18 and 38, respectively, and are patentable at least per the patentability of the claims from which they depend as discussed above. Appellants further note that the deficiencies of Konta and Christini are not cured by the disclosure of Pastore.

Accordingly, Appellants respectfully request that the rejections of Claims 4, 27 and 41 under § 103 be reversed.

CONCLUSION

In view of the above discussion, Appellants submit that the rejection of Claims 1-12, 15-18, 21-37, 39-49 and 52-54 should be reversed and the present application passed to issue.

Respectfully submitted,



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CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on January 18, 2008.

Laneisha C. Hayes
Date of Signature: January 18, 2008

Claims Appendix

1. (Previously Presented) A method for selectively initiating interventional therapy in a subject, comprising:

chronically detecting electrical activity in first and second cardiac regions in the subject;

identifying discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions; and

initiating interventional therapy in the subject responsive to the identification of discordant alternans, wherein the electrical activity comprises an electrogram from internally implanted electrodes positioned in an internal chamber and/or vessel of the heart of the subject.

2. (Original) The method of Claim 1, wherein the component comprises a duration, shape and/or amplitude of an STT segment.

3. (Original) The method of Claim 1, wherein the component comprises a duration, shape and/or amplitude of a T wave.

4. (Original) The method of Claim 1, wherein the component comprises a duration, shape and/or amplitude of an activation recovery interval (ARI).

5. (Original) The method of Claim 1, wherein the identifying discordant alternans is based on cycle-to-cycle variations in the detected electrical activity.

6. (Original) The method of Claim 1, wherein initiating interventional therapy is responsive to a change in the component from concordant to discordant alternans.

7. (Original) The method of Claim 1, wherein the interventional therapy reduces a risk of arrhythmia.

8. (Original) The method of Claim 1, wherein the interventional therapy reduces a risk of ventricular arrhythmia.

9. (Original) The method of Claim 1, wherein the interventional therapy reduces a risk of atrial arrhythmia.

10. (Original) The method of Claim 1, wherein the interventional therapy comprises introducing a pacing routine.

11. (Original) The method of Claim 1, wherein the interventional therapy comprises administering a shock.

12. (Original) The method of Claim 1, wherein the interventional therapy comprises administering a drug that reduces a risk of arrhythmia.

13.-14. (Canceled).

15. (Original) The method of Claim 1, wherein the component includes a duration of a cardiac signal component.

16. (Original) The method of Claim 1, wherein the component includes an amplitude of a cardiac signal component.

17. (Original) The method of Claim 1, wherein the component includes a shape of a cardiac signal component.

18. (Previously Presented) A system for selectively initiating interventional therapy in a subject, comprising:

a plurality of electrodes configured and sized to chronically detect electrical activity in first and second cardiac regions;

a discordant alternans monitor operably associated with the electrodes, the discordant alternans monitor configured to identify discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions; and to initiate interventional therapy in the subject responsive to the

identification of discordant alternans, wherein the electrodes are configured to be internally implantable and positioned in an internal chamber and/or vessel of the heart of the subject.

19.-20. (Canceled)

21. (Original) The system of Claim 18, further comprising a drug delivery system operably associated with the discordant alternans monitor, wherein the discordant alternans monitor is further configured to initiate interventional therapy by controlling the drug delivery system.

22. (Original) The system of Claim 18, wherein the electrodes are further configured to deliver a pulse to the respective cardiac regions, wherein the discordant alternans monitor is further configured to initiate interventional therapy by controlling the pulse to the electrodes.

23. (Original) The system of Claim 22, wherein the pulse comprises a pacing routine.

24. (Original) The system of Claim 22, wherein the pulse comprises a defibrillation pulse.

25. (Original) The system of Claim 18, wherein the component comprises a duration, shape and/or amplitude of an STT segment.

26. (Original) The system of Claim 18, wherein the component comprises a duration, shape and/or amplitude of a T wave.

27. (Original) The system of Claim 18, wherein the component comprises a duration , shape and/or amplitude of an activation recovery interval (ARI).

28. (Original) The system of Claim 18, wherein the discordant alternans monitor is configured to identify discordant alternans based on cycle-to-cycle variations in the detected electrical activity.

29. (Original) The system of Claim 18, wherein the discordant alternans monitor is configured to initiate interventional therapy responsive to a relative change in a component by detecting a change from concordant to discordant alternans.

30. (Original) The system of Claim 18, wherein the interventional therapy reduces a risk of arrhythmia.

31. (Original) The system of Claim 18, wherein the interventional therapy reduces a risk of ventricular arrhythmia.

32. (Original) The system of Claim 18, wherein the interventional therapy reduces a risk of atrial arrhythmia.

33. (Original) The system of Claim 18, wherein the electrical activity comprises an ECG signal from external electrodes.

34. (Original) The system of Claim 18, wherein the electrical activity comprises an electrogram from internally implanted electrodes.

35. (Original) The system of Claim 18, wherein the component includes a duration of a cardiac signal component.

36. (Original) The system of Claim 18, wherein the component includes an amplitude of a cardiac signal component.

37. (Original) The system of Claim 18, wherein the component includes a shape of a cardiac signal component.

38. (Previously Presented) A computer program product for selectively initiating interventional therapy in a subject, the computer program product comprising:

a computer readable storage medium having computer readable program code embodied in said medium, said computer-readable program code comprising:

computer readable program code configured to chronically detect electrical activity in first and second cardiac regions in the subject;

computer readable program code configured to identify discordant alternans in at least one component of the detected electrical activity based on a comparison of the electrical activity in the first and second cardiac regions; and

computer readable program code configured to initiate interventional therapy in the subject responsive to the identification of discordant alternans, wherein the electrical activity comprises an electrogram from internally implanted electrodes positioned in an internal chamber and/or vessel of the heart of the subject.

39. (Original) The computer program product of Claim 38, wherein the component comprises a duration, shape and/or amplitude of an STT segment.

40. (Original) The computer program product of Claim 38, wherein the component comprises a duration, shape, and/or amplitude of a T wave.

41. (Original) The computer program product of Claim 38, wherein the component comprises a duration, shape and/or amplitude of an activation recovery interval (ARI).

42. (Original) The computer program product of Claim 38, wherein the computer readable program code configured to identify discordant alternans further comprises computer readable program code configured to identify discordant alternans based on cycle-to-cycle variations in the detected electrical activity.

43. (Original) The computer program product of Claim 38, wherein the computer readable program code configured to initiate interventional therapy further comprises

computer readable program code configured to initiate interventional therapy responsive to a change in the component from concordant to discordant alternans.

44. (Original) The computer program product of Claim 38, wherein the interventional therapy reduces a risk of arrhythmia.

45. (Original) The computer program product of Claim 38, wherein the interventional therapy reduces a risk of ventricular arrhythmia.

46. (Original) The computer program product of Claim 38, wherein the interventional therapy reduces a risk of atrial arrhythmia.

47. (Original) The computer program product of Claim 38, wherein the computer program code configured to initiate interventional therapy further comprises computer program code configured to introduce a pacing routine.

48. (Original) The computer program product of Claim 38, wherein the computer program code configured to initiate interventional therapy further comprises computer program code configured to control the administration of a shock.

49. (Original) The computer program product of Claim 38, wherein the computer program code configured to initiate interventional therapy further comprises computer program code configured to initiate the administration of a drug that reduces a risk of arrhythmia.

50.-51. (Canceled).

52. (Original) The computer program product of Claim 38, wherein the component comprises a duration of a cardiac signal component.

53. (Original) The computer program product of Claim 38, wherein the component comprises an amplitude of a cardiac signal component.

54. (Original) The computer program product of Claim 38, wherein the component comprises a shape of a cardiac signal component.

55. (Previously Presented) The method of Claim 1, wherein the internally implanted electrodes are connected to internally implanted catheters.

56. (Previously Presented) The system of Claim 18, wherein the internally implanted electrodes are connected to internally implanted catheters.

57. (Previously Presented) The computer program product of Claim 35, wherein the internally implanted electrodes are connected to internally implanted catheters.

Evidence Appendix

NONE

Related Proceedings Appendix

NONE